



CCAMA News & 1999 Accomplishment Report

Winter 2000

Happy New Year! And welcome to the Winter 2000 issue of the Central Cascades Adaptive Management Area newsletter. As you may have noticed, this issue is also serving as our accomplishment report for 1999. The report is organized by the three major themes in our Strategic Guide:

- 1) Ecosystem management learning through research, management studies, and monitoring
- 2) Communicating for shared learning and adapting practices, and
- 3) Linking people and communities with ecosystem management.

We are proud of the following efforts and the progress we have made. After reading through this report, we hope you will feel the same. *Thank you and best wishes for the new year!*

Theme 1

Ecosystem Management Learning through Research, Management Studies and Monitoring

A major emphasis of the Central Cascades Adaptive Management Area (CCAMA) has been to develop methods for application of historical information about ecosystems to landscape management strategies. The underlying assumption of this approach is that risks posed to native species and ecological processes from management activities can be minimized by incorporating key aspects of important disturbance regimes into management regimes. Disturbance processes, such as fire and landslides, have historically played major roles creating and sustaining the pattern of habitats across the landscape.

BLUE RIVER LANDSCAPE STUDY

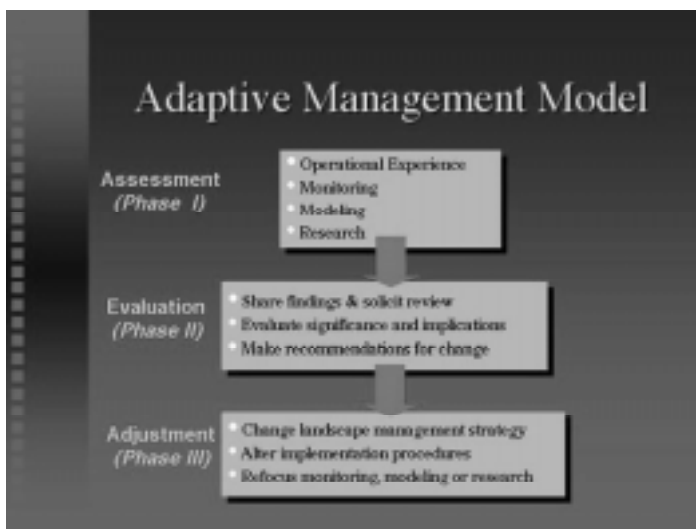
A team of scientists and managers based on the H.J. Andrews Experimental Forest and the Blue River Ranger District of the Willamette National Forest have been working together to develop and test a landscape man-

agement approach based on natural disturbance regimes with the Blue River Landscape Study. The landscape management approach used in the study is intended to meet the same general objectives underlying the Northwest Forest Plan: provide habitat to sustain species associated with late-successional forests, maintain and restore aquatic ecosystems, and provide a sustainable supply of timber. The goal of the study is to implement this approach on the ground and evaluate results through a combination of field monitoring and modeling assessments. As new information becomes available, adjustments will be made to both the management approach and to the monitoring and modeling assessments.

Significant progress was made on several aspects of the study in 1999. Pre-treatment monitoring plots were established to measure the response of trees, understory vegetation, and epiphytic lichens in areas where timber

sales have been sold or are pending. Stream and riparian monitoring networks were also established on three sets of small streams to measure stream temperature, amphibians, channel condition and riparian vegetation.

A road assessment and restoration strategy for the watershed are near completion. Every road in the watershed has been evaluated in terms of risks to the aquatic ecosystem and the likely need for future human uses. Restoration strategies are now being formulated and integrated into the landscape study. Research scientists and a graduate student class from Oregon State University have been assisting with this process.



The Blue River Landscape Study has now progressed to the point that we are considering changes to the landscape management approach. Initial modeling assessments, new research and recent operational experience have surfaced a number of questions and new ideas relevant to conduct of the study. A team of individuals at the Blue River Ranger District are now evaluating these questions and will be making recommendations for potential changes this winter. We invite you to follow this process via our Blue River Landscape Study web site (www.fsl.orst.edu/ccem/brls.html) and respond to us with your thoughts concerning the future course of this study.

-JOHN CISSEL, WILLAMETTE NATIONAL FOREST

EDITORS NOTE: A research paper describing this project was recently published in Ecological Applications. See the last page to order a copy.

MIDDLE MCKENZIE LANDSCAPE DESIGN

The Bureau of Land Management McKenzie Resource Area is preparing a landscape design for the Middle McKenzie Landscape Area (MMLA) using many of the concepts and approaches developed for the Blue River Landscape Study. Application of historical information in the MMLA offers a different setting, including substantial intermixed public and private lands, to further test the feasibility of these ideas. The MMLA is within the Central Cascades Adaptive Management Area and lies two miles east of Leaburg. Federal lands within the MMLA total 23,735 acres (approximately 14% of the federal lands within the AMA).

The landscape design has incorporated information contained in a fire history study completed on the Bear Creek and Marten Creek watersheds into a preliminary landscape design. The fire history information is being used to determine the frequency of timber harvests, the rotation length between harvests, and the amount, distribution, and species composition of retention trees. The MMLA has been divided into two landscape areas where different rotation lengths and different silvicultural prescriptions will be proposed for implementation. The landscape design will also recommend temporal and spatial design of timber harvest, suggest watershed restoration activities, monitoring, and research projects. Revised riparian and small-basin reserves will serve as intermediate scale refugia and corridors to help meet the aquatic conservation strategy objectives.

-EMILY RICE, EUGENE DISTRICT BLM



The McKenzie River near Ben and Kay Dorris State Park

MONITORING FOCUSES ON ELUSIVE TALL BUGBANE

Tall bugbane (*Cimicifuga elata*) is a seldom seen resident of the Central Cascades AMA. The species is an herbaceous perennial plant that inhabits shady slopes under forests containing hardwoods, particularly bigleaf maple. The flowering stems of tall bugbane grow to a height of four to six feet and form racemes of delicate white flowers. Tall bugbane is found west of the Cascade Range crest from British Columbia to southern Oregon. Most of the populations within the range occur in Oregon and several are found in the AMA.

Tall bugbane is designated as a sensitive species by the Forest Service and BLM. Its preference for conifer forest has put it at odds with timber harvest and associated activities. Some individual plants may survive logging operations, however, they are intolerant of the conditions under the closed canopy forests that follow 30-40 years after initial harvest. Furthermore, deer and elk, which prefer to forage in recently harvested areas, readily browse on tall bugbane and prevent plants from reaching reproductive size. Tall bugbane has reputed medicinal value and is closely related to black cohosh (*C. racemosa*). Roots and leaves have apparent sedative and anti-inflammatory properties and may be used to treat a variety of ailments from menstrual cramps to rheumatoid arthritis.

Monitoring of tall bugbane was initiated in 1992 on the Sweet Home Ranger District of the Willamette National Forest and has continued biannually with the intent of examining population dynamics. Three populations have

been intensively monitored. Parameters measured include plant size, reproductive status, and evidence of herbivory. Individual plants were tagged and mapped and are relocated from year to year. Additional populations are monitored less formally, verifying the plants are still present and no major changes to the habitat have occurred. Populations located in areas little used by deer and elk, for instance, on rock outcrops and adjacent to well-traveled roads, have the highest percentage of flowering individuals and a low rate of plant mortality. The population accessible to deer and elk is more variable and has a low percentage of flowering plants and high variation in the number of plants returning from one year to another. Smaller plants, particularly seedlings, lead a precarious existence and sometimes do not return after their initial appearance. Despite this population's variability, the populations as a whole appear to be stable.



MARCIA MORSE

Tall bugbane

Several additional studies have been done or are in progress, including a look at tall bugbane's genetic diversity and the effectiveness of fencing and big game repellents to deter browsing. Management activities planned near some populations include thinning conifers in both plantations and natural stands to allow more room for bigleaf maples. This is planned in areas adjacent to tall bugbane populations in an effort to improve habitat for the species.

-ALICE SMITH, WILLAMETTE NATIONAL FOREST



MONITORING STREAM TEMPERATURES

Stream temperatures in the McKenzie River are important to a wide variety of aquatic life, particularly for the cold water-loving bull trout, a federally listed threatened species. Stream temperature patterns are influenced by a diverse set of both cold and warm water sources including hot springs, glacier-fed tributaries, and reservoirs. Stream temperatures limit vertebrate productivity and survival, particularly for the cold-water loving bull trout. A stream temperature study was undertaken to better understand the importance of these water sources to temperatures in the river.

In August 1999, the McKenzie Ranger District collected aerial video imagery on approximately 37 miles of streams within the Central Cascades AMA. Data collection occurred along portions of Deer Creek, the South Fork of the McKenzie River, and the main stem of the McKenzie River. Simultaneous normal color and infrared video imagery were collected, geo-referenced, and stored digitally in real time on board a helicopter.

The infrared imagery was also temperature calibrated to stream conditions through strategic placement of in-stream thermographs during the flight period.

The streams that were surveyed are considered water quality limited due to high temperatures. The resulting information from this project will provide a snapshot of the spatial temperature distributions in these streams. We hope to compare these distributions with what we know of existing heat sources, to better understand where and how streams are being heated. As our understanding of these processes increases, management to meet water quality objectives will improve. This project was partially funded by a grant from the National Fish and Wildlife Foundation.

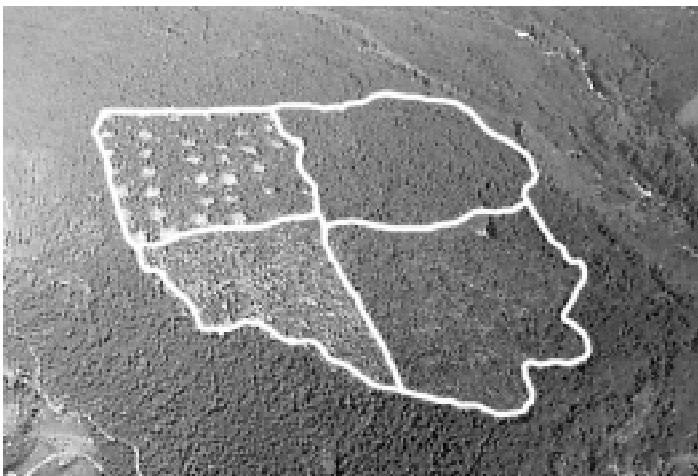
-DAVE KRETZING, WILLAMETTE NATIONAL FOREST

EDITORS NOTE: A report containing project results was received just as this report went to press and is available from Dave Kretzing (McKenzie Ranger District).

YOUNG STAND STUDIES

Young Stand Thinning and Diversity Study:

Work continued on the Young Stand Thinning and Diversity Study which was initiated 10 years ago to examine the consequences of alternative commercial thinning, gap and snag creation strategies, and underplanting approaches.



Aerial view of all four treatments in the Young Stand Thinning and Diversity Study. Clockwise from upper left: light thin w/gaps, control, light thin, heavy thin

This was the second post-treatment remeasurement of the study, representing the 3rd year after treatment, a critical point in time for these very dynamic young stands. Four crews were involved in remeasuring vegetation, small mammals, neotropical birds and chanterelle mushrooms. Some additional data currently being gathered includes: 1) GPS coordinates for plot centers and reference points; 2) mapping skyline corridors and skid trails to provide better integration of data between logging systems, vegetation, and other resource responses.

The data is currently being edited and entered into the Forest Science Database. Analysis will be conducted this winter and preliminary reports will be coming out in March of 2000. Additional post-treatment measurements are planned for 2001 and 2006.

EDITORS NOTE: A workshop to share results from the 1999 sampling is being planned for this coming spring. Also, reports covering components of the study already completed (logging costs and impacts) are available from Jim Mayo (Blue River Ranger District).

Young Stand Modeling:

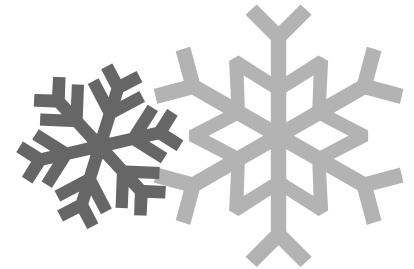
A stand modeling project using the Zelig stand growth model was undertaken to provide insights into the development of late-successional habitat over time with various thinning treatments. All possible combinations of four alternative thinning densities at three stand ages were modeled, resulting in 64 simulations. These simulations were repeated for a range of rotation ages and canopy retention levels. Results indicate a range of thinning treatments can attain late-successional habitat at about the same time, but with different trade-offs in terms of merchantable volume, wood quality and long-term stand conditions. The voluminous report resulting from this project provides a valuable resource to help

answer current stand development questions (available from Jim Mayo (Blue River Ranger District)).

The Very Young Stand Study:

This study includes a series of precommercial thinning treatments aimed at increasing diversity in young plantations. Treatments include a variety of very small gap sizes combined with thinning between gaps. The treatments have been implemented and permanent plots were established this past summer to begin monitoring changes in stand conditions. This study is replicated on the Mt. St. Helens National Volcanic Monument and on lands managed by the Dept. of Natural Resources in Washington.

-JIM MAYO, WILLAMETTE NATIONAL FOREST



GATHERING MOSS: ESTIMATING THE SIZE OF THE RESOURCE AND ACCUMULATION RATES

As moss grows in importance as a non-timber forest product in the Pacific Northwest, federal land managers are increasingly faced with writing harvest guidelines on which to base moss harvest permits. During 1997-1999, the Eugene District Bureau of Land Management and the Willamette National Forest in cooperation with Oregon State University, implemented a study to explore the development of indices of “harvestability” that could be used to estimate the potential “harvestable” moss biomass within an area. The study area included the Central Cascades Adaptive Management Area (AMA), as well as other lands within the Eugene District BLM, and the Sweet Home Ranger District of the Willamette National Forest.

The objectives of the study were to: (1) Improve the estimates of the size of the moss resource available for harvesting, (2) Establish plots for monitoring moss mat re-accumulation and estimate the mat accumulation rates on a large scale using methods previously developed and, (3) Describe the species composition of bryophyte communities.

Results

The study area appears to lack the moss biomass that is

found in other geographic areas of higher rainfall. Estimates of harvestable moss biomass on shrubs are substantially lower in the study area than those recorded for other geographic regions, such as the Oregon north coast.

There are some predictive tools that can be used to help estimate harvestable moss. The rate of moss accumulation (.4 g/m/yr) reflects the relatively dry conditions in the study area and predicts that moss accumulation will be sufficiently slow as to not appreciably increase the harvestable moss inventory within the foreseeable future.

Within those sites that have mossy areas, topographic position appears to be an important influence on species composition, probably through its effect on humidity. Relative humidity affects the abundance of taxa that require relatively wet (or dry) conditions. Within mossy sites, the presence of hardwood trees contributes a unique community that with time is able to colonize nearby shrub stems, increasing stand and stem level diversity.

-NANCY WOGEN, EUGENE DISTRICT BLM

EDITORS NOTE: Contact Nancy Wogen (Eugene BLM) for a copy of the final report.

F-THIN MONITORING OF CANOPY COVER

Interdisciplinary team members often prefer using percent canopy cover as a means to describe stand density objectives for commercial thinning. This may be because it is easier to visualize and it more directly correlates to habitat needs and snow interception than traditional silviculture density concepts like basal area or relative density. This creates a challenge for silviculturists to implement because of the different ways percent canopy cover can be defined and measured, and because the correlation between traditional density measurements and percent canopy cover is often stand specific.

This monitoring project on the Sweet Home Ranger District within the Central Cascades AMA looks at the accuracy of prescriptions using percent

canopy cover by comparing the target of 60-70% canopy cover with the end-result using a variety of measurement tools. Permanent plots were established so future measurements can be made to document rates of canopy closure. Thinning was completed in 1998 on the first of two planned sales, and monitoring measurements were completed in 1999.

Direct canopy measurement tools used were: (1) vertical densitometer; (2) spherical densiometer; (3) fish-

eye camera; and (4) ocular estimates by crew. Canopy closure will also be calculated indirectly using a ratio of crown diameters to tree diameters.

Preliminary findings show that vertical densitometer readings averaged 63% on 5 subdivisions with 1 subdivision falling below the 60-70% target. The highest subdivision measured 68% canopy closure. The spherical densitometer readings averaged 15% higher than the vertical readings on the same subdivisions. Crew estimates averaged 3% below the vertical densitometer readings.

The higher spherical densitometer readings are to be expected since the spherical measurement is also measuring light coming in from the sides of

the stand and is not a pure vertical projection. The fish-eye camera lens may have this same problem. However, the plan is to measure a small area (angle) at the top of the lens to better approximate a vertical projection sample.

-BILL PORTER, WILLAMETTE NATIONAL FOREST

EDITORS NOTE: Contact Bill Porter (Sweet Home Ranger District) for more information.



Post-treatment photo of F-Thin unit



Theme 2

Communicating for Shared Learning and Adapting Practices

AMA WORKSHOP TAKES PARTICIPANTS “BEYOND THE BUZZWORDS”

Over 200 resource managers and scientists from around the Pacific Northwest attended the March 10, 1999 workshop, “Beyond the Buzzwords: An early progress report on adaptive management”. Held in Springfield, Oregon and hosted by the Central Cascades Adaptive Management Area, the workshop included presentations and displays from many of the Adaptive Management Areas (AMAs) throughout the region. Workshop goals were to: 1) share information and results from monitoring and adaptive management projects within western Oregon and across the AMA network, 2) demonstrate how monitoring and adaptive management projects have been or will be used to affect management practices within western Oregon and across the AMA network, and 3) share information on how adaptive management has linked people and communities with ecosystem-based management.



Over 40 posters were available for study by workshop participants during the day-long AMA workshop

A compilation of abstracts and contact information for both speaker and poster presenters is available on request to Pam Druliner, pdruline/r6pnw_willamette@fs.fed.us, or (541) 822-1213.

-PAM DRULINER, CASCADE CENTER



TECH TRANSFER PROGRAMS TAKE OFF

The March AMA workshop and our seasonal Nature Talks! program (see next story) are just two examples of communication efforts championed by the Andrews Forest and Cascade Center programs. In fact, for the last six years, we have outreached to over 2,000 people annually through field tours, presentations, workshops, and symposia. In addition, the research community maintains a prodigious publication pace in scholarly journals, technical reports, and books. A sample selection related to studies of interest to the AMA are listed on page 11.

In addition to these more traditional vehicles, both the Andrews and Cascade Center have developed websites where students, teachers, managers, and other scientists can access up-to-date information about our programs and studies. Take a look and tell us what you think:

H.J. Andrews: www.fsl.orst.edu/lter
Cascade Center: www.fsl.orst.edu/ccem

NATURE TALKS! CASCADE CENTER PROGRAM KEEPS EDUTAINING

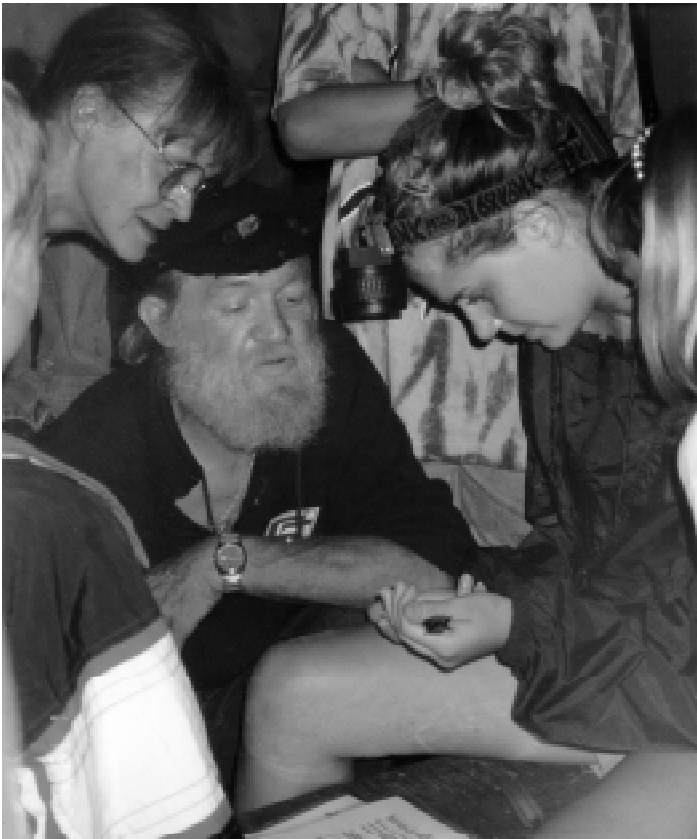
What do Teddy Roosevelt, a modern-day Tarzan, a Kalapuya Indian storyteller, and a group of sleep-deprived teenagers have in common? They were all presenters during the 1999 season of Nature Talks!, the Cascade Center's summer forest ecology and culture presentation series.

Initiated in 1994, the popular program capitalizes on forest science information generated by the research program at the nearby H.J. Andrews Experimental Forest. Presenters include Andrews Forest-based scientists from the Pacific Northwest Research Station and Oregon State University, and resource managers from the Willamette National Forest. Additional presenters have included resource specialists from other management agencies and historical and cultural presentations by local performers.

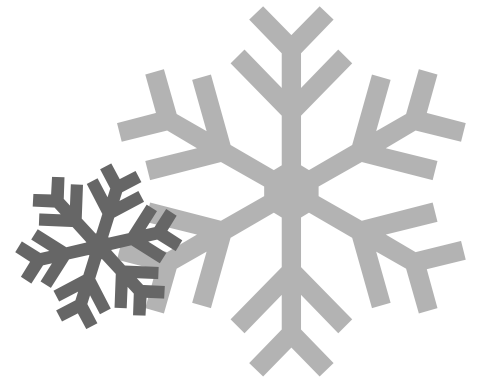
The 1999 series schedule can be viewed on the Cascade Center Website at: www.fsl.orst.edu/ccem/learning.html. Ideas for future presentation topics are welcome and encouraged – contact Pam Druliner, pdruline/r6pnw_willamette@fs.fed.us or (541) 822-1213.

P.S. Incidentally, Teddy Roosevelt was portrayed by Jim Denney from the McKenzie Ranger District; our modern-day Tarzan was Bill Denison, retired Oregon State University botany professor; and our sleepy teenagers were field technicians who survey and monitor bat populations for the Willamette National Forest in an innovative program led by Stuart Perlmeter, a Thurston High School biology teacher.

-PAM DRULINER, CASCADE CENTER



Audience members get a bug's eye view of a bat at the popular Nature Talks! program in the Delta Amphitheatre near Blue River, Oregon



Theme 3

Linking People and Communities with Ecosystem Management

ADAPTIVE MANAGEMENT AND THE MCKENZIE WATERSHED COUNCIL

Sometimes it just seems smart to collect data for the long term, even when you aren't 100% sure of its future use! Water quality is an example of that type of data. The Adaptive Management Area and the McKenzie Watershed Council have been partners in collecting data from both permanent monitoring stations and by field-going individuals throughout the watershed.

The state Department of Environmental Quality runs seven permanent monitoring sites in the McKenzie sub-basin, where everything from temperature to fecal coliform is tabulated. The stations are strategically located to monitor some of the larger stream systems that contain private, federal and mixed ownership lands. The data will provide us with long-term trends that may indicate changes over time in critical attributes of concern. This is one of the most comprehensive sub-basin monitoring systems in the state of Oregon.

THE WILLAMETTE PROVINCE WORKFORCE PARTNERSHIP

The Willamette Province Workforce Partnership (WPWP) is dedicated to maintaining a highly skilled workforce within our local communities. Building on a foundation created in 1994 as a workforce training program, the partnership has grown to the point where year-round quality jobs are now provided through multi-project, multi-agency contracts. Key partners include the Willamette National Forest, the Eugene and Salem Districts of the Bureau of Land Management (BLM), the University of Oregon (UO) Ecosystem Workforce Project, and the Oregon Department of Forestry.

Federal funding from the Jobs in the Woods program, restoration dollars, and resource project funds are pooled to provide contracts for local workers in a unique

The AMA is also helping to fund McKenzie Watershed Council flood monitoring. When the river rises after a heavy rain event, a network of employees and volunteers head out to collect water samples at sites scattered throughout the sub-basin. The samples are tested for the amount of dirt or "sediment" they contain. The hope is that this type of monitoring will identify "hot spots" or activities that are the source of muddy water. That information can then be used to reduce or eliminate sediment at the source with the cooperation of the landowner. There are 32 sampling sites in the sub-basin, primarily on Bureau of Land Management and National Forest lands.

Hopefully, this information will prove valuable in the future as we sleuth for troublesome risks to our water quality. The McKenzie River is a precious resource that we intend to keep our eye on!

-CHERYL FRIESEN, WILLAMETTE NATIONAL FOREST

"bundled" design. This "bundling" offers a seamless contract across agency lines, and combines small projects into a more attractive multi-project package. In the past, contracts were awarded based upon the lowest bid. Now contracts can be awarded based on "best value", that is, when a contractor meets the best overall interests of the government. This strategy has several benefits for local workers. Work is retained within the local area; employment durations are longer; and pay and benefits are competitive and commensurate with worker skills. Local workers are also able to expand their skills to meet workforce needs and their individual desires.

The program has been steadily expanding each year as additional funding sources and candidate projects are

identified. The WPWP is now identifying milestones for the future as they build capacity for high-skill jobs of longer durations. They have learned a great deal since 1994, and they know that developing partnerships is critical to success for workers, the agencies, and to obtaining good work on the ground. Brad Leavitt of the Forest Service has been with the partnership since it began. He gets a real sparkle in his eyes when he speaks of the work the partners have accomplished, and the contractors who have benefitted from the program. "When the guy at the local gas station in Sweet Home says 'hey, I just talked to a contractor, and I hear there's a great contract program I ought to look into', well, it

does my heart good."

If you have comments or questions for the WPWP, contact any of these partners:

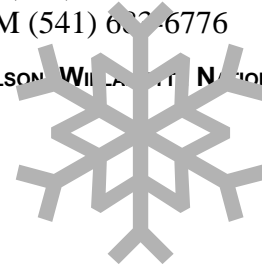
Mike Rassbach or Brad Leavitt, Sweet Home Ranger District (541) 367-5168

Charles Spencer, U.O. Ecosystem Workforce Project (541) 346-0676

Pete Schay, Salem BLM (503) 375-5671

Emily Rice, Eugene BLM (541) 682-6776

-SUE OLSON, WILLAMETTE NATIONAL FOREST



THE MCKENZIE COMMUNITY DEVELOPMENT PROJECTS GUIDE

There's no shortage of good ideas for projects to better link McKenzie River communities with the surrounding ecosystems. A new report, *The McKenzie Community Development Projects Guide*, was prepared this year for the Central Cascades AMA. The intent of the report is to foster communication among interested community members and organizations about the status of local projects and the potential to move identified projects forward. This guide is the next step in an ongoing process. Projects in the guide were derived from community and agency member's ideas presented in the McKenzie Discovery Process report (1997), and in the McKenzie River Strategic Plan (1995).

The guide describes potential community projects, suggests possible next steps, and attempts to explain how

the Forest Service or Bureau of Land Management may be able to help out. The guide is organized in two sections: one describing projects that are outside of the scope of the two federal agencies, and the other describing projects within the federal agencies jurisdiction. Most of the latter projects are recreational in nature.

A large number (29) of potential projects are identified in the report. What happens next with these projects depends on the efforts of a variety of individuals inside and outside of the agencies. Nearly every project identified in the report will require collaborative efforts. If you are interested in obtaining a copy of the report, contact Sam Swetland, 822-1242 at the Blue River Ranger District. If you are interested in seeing one of these projects move forward, contact people you think can help.

-SAM SWETLAND, WILLAMETTE NATIONAL FOREST



This issue of the Central Cascades Adaptive Management Newsletter
was edited by John Cissel and designed and produced by Pam Druliner.



NEW PUBLICATIONS FROM THE CASCADE CENTER FOR ECOSYSTEM MANAGEMENT

The following new publications are selections from work published in 1999. Copies are available on request via mail, fax, or email from:

Pam Druliner/Cascade Center
PO Box 199
Blue River, OR 97413
FAX: (541)822-1255
EMAIL: pdruline/r6pnw_willamette@fs.fed.us

- ☐ Cascade Center for Ecosystem Management. 1999. The H.J. Andrews uneven-aged management project: managing young stands. Corvallis, OR: Department of Forest Science, Oregon State University; Corvallis, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station; Blue River, OR: Blue River Ranger District, Willamette National Forest. 2p.
- ☐ Cascade Center for Ecosystem Management. 1999. Mycorrhizal fungal mats: role in forest productivity. Corvallis, OR: Department of Forest Science, Oregon State University; Corvallis, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station; Blue River, OR: Blue River Ranger District, Willamette National Forest. 2p.
- ☐ Cascade Center for Ecosystem Management. 1999. Quartz Creek restoration project: aquatic ecosystem response. Corvallis, OR: Department of Forest Science, Oregon State University; Corvallis, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station; Blue River, OR: Blue River Ranger District, Willamette National Forest. 2p.
- ☐ Cascade Center for Ecosystem Management. 1999. Residual stand damage from thinning: young stand thinning and diversity study. Corvallis, OR: Department of Forest Science, Oregon State University; Corvallis, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station; Blue River, OR: Blue River Ranger District, Willamette National Forest. 2p.
- ☐ Cissel, John; Swanson, Frederick. Blue River Landscape Study: testing an alternative approach. In: Proceedings, Views from the Ridge conference; 1999 November 2-4; Vancouver, WA. Portland, OR. Also available at: www.fsl.orst.edu/ccem/brls.html.
- ☐ Cissel, John H., Swanson, Frederick J., Weisberg, Peter J. 1999. Landscape management using historical fire regimes: Blue River, Oregon. *Ecological Applications* 9:1217-1231.
- ☐ Duncan, Sally with Fred Swanson and John Cissel. 1999. Messy world: managing dynamic landscapes. *Science Findings*. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station; September (18). 6p.
- ☐ Garman, Steven L.; Swanson, Frederick J.; Spies, Thomas A. 1999. Past, present, and future landscape patterns in the Douglas-fir region of the Pacific Northwest. In: Rochelle, James A.; Lehmann, Leslie A.; Wisniewski, Joe, eds. *Forest fragmentation: wildlife and management implications*. Leiden, The Netherlands: Koninklijke Brill NV:61-86.
- ☐ Han, Han-Sup; Kellogg, Loren D. 1997. Comparison of damage characteristics to young Douglas-fir stands from commercial thinning using four timber harvesting systems. In: Ball, John J.; Starnes, Lawson W., eds. *Proceedings: Forest operations for sustainable forests and healthy economies*; 1997 July 28-31; Rapid City, SD: Council of Forest engineering (COFE):76-85.
- ☐ Hart, Stephen C.; Perry, David A. 1999. Transferring soils from high-to-low-elevation forest increases nitrogen cycling rates: climate change implications. *Global Change Biology*. 5:23-32.
- ☐ Landres, Peter B.; Morgan, Penelope; Swanson, Frederick J. 1999. Overview of the use of natural variability concepts in managing ecological systems. *Ecological Applications*. 9(4):1179-1188.
- ☐ Means, J.E.; Acker, Steven A.; Harding, David A. [and others]. 1999. Use of large-footprint scanning airborne lidar to estimate forest stand characteristics in the western Cascades of Oregon. *Remote Sensing of Environment*. 67:298-308.
- ☐ Perry, David A. 1998. The scientific basis of forestry. *Annu. Rev. Ecol. Syst.* 29:435-66.
- ☐ Shindler, Bruce; Cheek, Kristin Aldred; Stankey, George H. 1999. Monitoring and evaluating citizen-agency interactions: a framework developed for adaptive management. *Gen. Tech. Rep. PNW-GTR-452*. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 38p.
- ☐ Weisberg, Peter J. 1999. An evaluation of the Blue River Landscape Project: How well does it use historical fire regimes as a model? Ft. Collins, CO: Colorado State University; final report. 24p.
- ☐ Wondzell, Steven M.; Swanson, Frederick J. 1999. Floods, channel change, and the hyporheic zone. *Water Resources Research*. 35(2):555-567.

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For Official Business Only



Bringing together research, communities and resource professional to guide a future for natural resources management.